

TWO NEW SPECIES OF CORAL TOADFISHES,
FAMILY BATRACHOIDIDAE, GENUS *SANOPUS*,
FROM YUCATAN, MEXICO, AND BELIZE

Bruce B. Collette

Abstract.—*Sanopus reticulatus*, new species, is described from three specimens collected at Progreso, Yucatan, Mexico. It differs from the other species of *Sanopus* in its reticulate body pattern and shorter distance from snout to second dorsal fin origin (403–419 versus 420–487 thousandths of standard length). It is most closely related to *S. barbatus* and *S. johnsoni*, species with mottled bellies, branched chin barbels, and high numbers of fin rays and vertebrae. *Sanopus greenfieldorum*, new species, is described from three specimens collected at Carrie Bow Cay, Belize. It is most closely related to *S. astrifer* but has light lines on its head instead of light spots.

While examining fishes in the Zoological Museum of the University of Hamburg (ZMH) in September 1982, I was surprised to discover a fine specimen of toadfish collected in Yucatan in 1893 that was identified as *Opsanus tau*. It was clearly a specimen of *Sanopus* with a distinctive pattern and was from the Gulf of Mexico, beyond the known range of the genus (Cozumel Is., Quintana Roo, south to Panama); I suspected it represented an undescribed species. Subsequently, two additional specimens of this species were located at the Museum of Comparative Zoology (MCZ) at Harvard that had been misidentified as *Opsanus pardus* by Barbour and Cole (1906). A second new species was discovered first by David W. and Teresa A. Greenfield on the barrier reef near Carrie Bow Cay, Belize, in 1974 about the time my (1974) revision of *Sanopus* was published. Another specimen of this species was collected at Carrie Bow Cay in 1980, and a juvenile in 1983.

The purpose of this paper is to describe these two new species and to compare them with the four known species in the genus: *S. barbatus* (Meek and Hildebrand), *S. astrifer* (Robins and Starck), *S. splendidus* Collette, Starck, and Phillips, and *S. johnsoni* Collette and Starck (see Collette 1974).

Counts and measurements follow those given in my review of *Sanopus*. Tables of meristic data presented there are not repeated here. Material of the four previously treated species housed at the National Museum of Natural History (USNM) was compared with the new species. Specimens of *S. astrifer* and *S. barbatus* from the Field Museum of Natural History in Chicago (FMNH) collected subsequent to 1974 were examined to increase the sample size of comparative material.

Sanopus reticulatus, new species

Figs. 1A–B

Opsanus pardus non Goode and Bean, Barbour and Cole, 1906:159 (two specimens from Progreso).

Holotype.—ZMH 20930, male, 236 mm SL, Mexico, Yucatan, Progreso; Weiss, 25 Jan 1893.

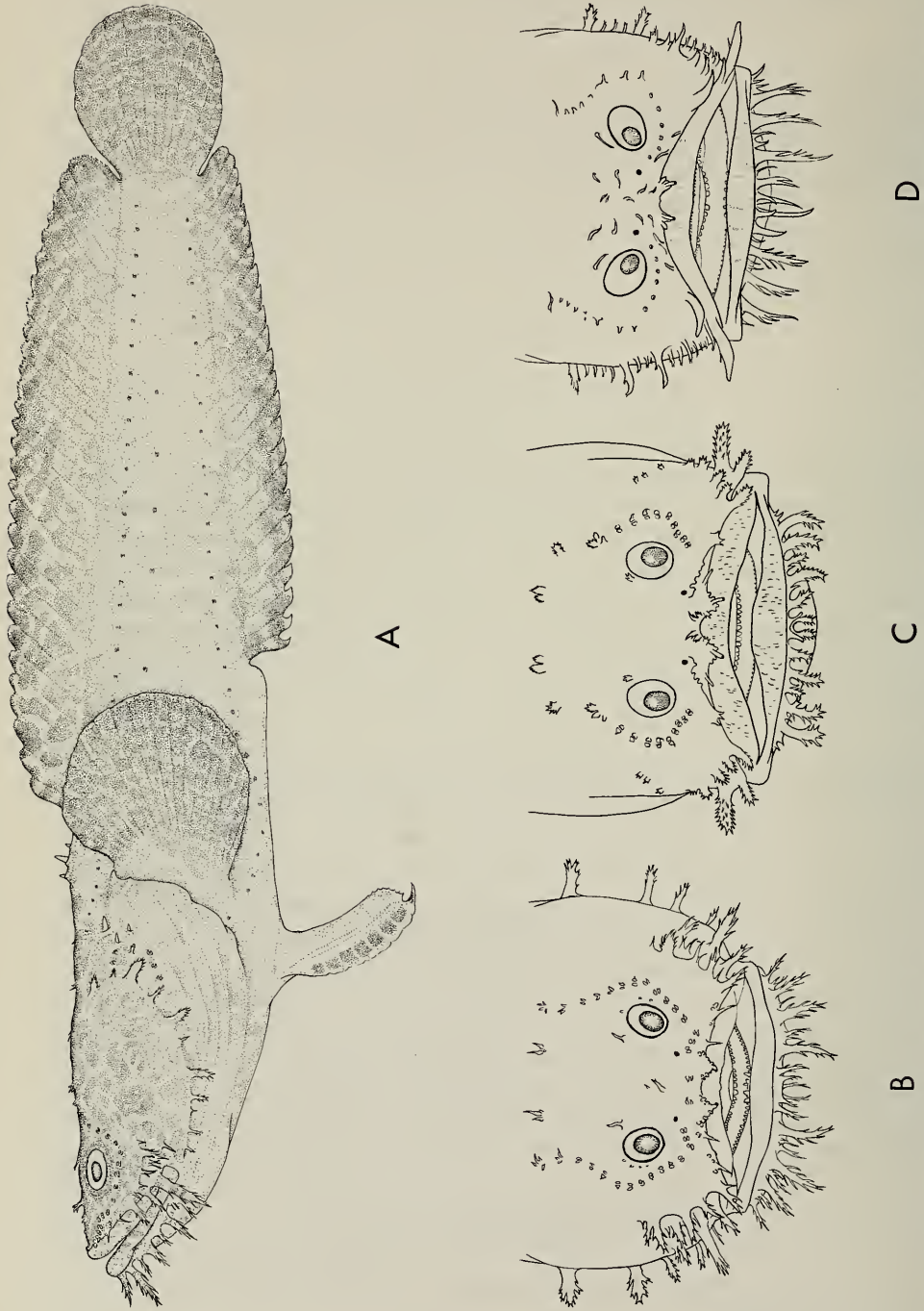


Fig. 1. A, *Sanopus reticulatus* (holotype, ZMH 20930, 236 mm SL, Progreso, Yucatan, Mexico); B-D, Diagrammatic anterodorsal views of heads of three species of *Sanopus*: B, *S. reticulatus* (holotype, ZMH 20930, 236 mm SL, Progreso, Yucatan, Mexico); C, *S. barbatus* (USNM 211322, 250 mm SL, Bonacea, Honduras); D, *S. johnsoni* (holotype, USNM 205945, 253 mm SL, Cozumel Is., Mexico).

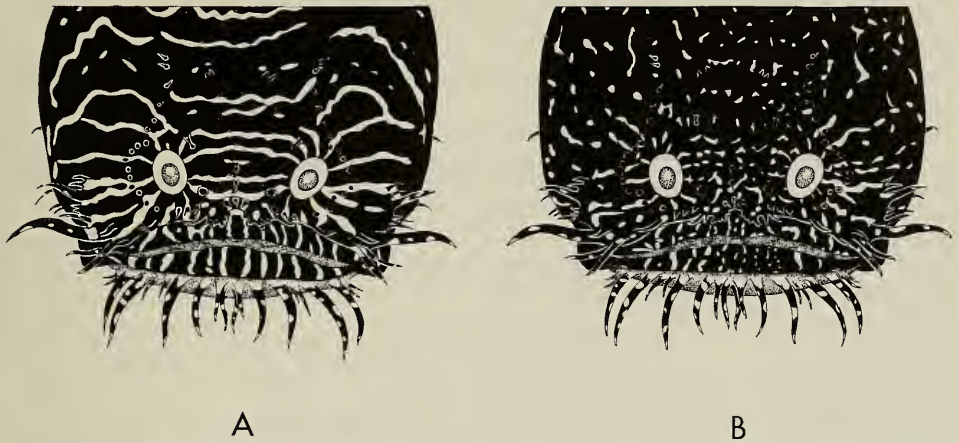


Fig. 2. Diagrammatic anterodorsal views of heads of two species of *Sanopus*. A, *S. greenfieldorum* (holotype, USNM 213555, 280 mm SL, Carrie Bow Cay, Belize); B, *S. astrifer* (USNM 209720, 245 mm SL, Glovers Reef, Belize).

Paratypes.—MCZ 32889 (233 mm SL) and USNM 258111 (225 mm), Mexico, Yucatan, Progreso, Leon J. Cole, early 1904.

Diagnosis.—Differs from the other five species of *Sanopus* in having a reticulate pattern on the body and head (Fig. 1A). Similar to *S. barbatus* and *S. johnsoni* and different from *S. astrifer*, *S. greenfieldorum*, and *S. splendidus* in having branched chin barbels. Maxillary barbel branched as in the first two species but more deeply divided than in either of them (Fig. 1B–D). Distance from tip of snout to origin of second dorsal fin (Table 1) shorter (403–419 thousandths of SL, \bar{x} 413.7) than in the other species (420–487, means 432.5–451.0). No cirri present in interorbital region as are present in *S. johnsoni* (Fig. 1D).

Description.—Dorsal fin rays III, 31–32; anal fin rays 25–26; pectoral fin rays 19–20; vertebrae 11 + (27–29) = 38–40; upper lateral line papillae 34–36; lower lateral line papillae 30–32; dentary teeth 18–19; palatine teeth 9–14; total vomerine teeth 8–10; and premaxillary teeth 34–41 in one or two rows on each jaw. Body proportions given in Table 1.

Etymology.—Named in reference to its diagnostic color pattern.

Biology.—The holotype is a male with well-developed gonads. Both paratypes are immature. The holotype had a specimen of majid crab in its stomach, *Macrocoeloma trispinosum* (Latreille). There was a snail in the intestine of one of the paratypes.

Sanopus greenfieldorum, new species

Fig. 2A

Holotype.—USNM 213555, male, about 280 mm SL, Belize, 2 mi. S of Carrie Bow Cay; D. W. and T. Greenfield, G74-21; 24 Jul 1974.

Paratypes.—FMNH 94575, ripe female, about 270 mm SL, Belize, between Carrie Bow Cay and South Water Cay; E. Reynaud; 10 Mar 1980. USNM 261601, 29.3 mm, Carrie Bow Cay; G. Hendler; 2 Apr 1983.

Diagnosis.—Similar to *S. astrifer* in having a dark body with prominent light markings. Differs from *S. astrifer* in having many light lines on head (Fig. 2A)

Table 1.—Morphometric comparison (in thousandths of standard length) between adults of the six species of *Sanopus*.

Character	<i>S. reticulatus</i> (n = 3)			<i>S. barbatus</i> (n = 12)			<i>S. johnsoni</i>		
	Range		\bar{x}	Range		\bar{x}			
SL (mm)	225	236	231.3	213	370	309.5			253
Head length	326	363	340.0	341	397	375.5			352
Head width	245	303	265.3	295	322	310.9			295
Orbital	40	45	43.3	34	52	43.2			42
Interorbital	61	77	71.0	85	108	95.3			89
Snout-2 dorsal fin origin	403	419	413.7	427	471	447.5			439
Snout-anal fin origin	587	592	589.3	572	647	604.9			581
Pectoral fin length	162	183	172.3	157	199	172.3			175
Pelvic fin length	132	157	140.7	131	159	146.6			153
Character	<i>S. greenfieldorum</i> (n = 2)			<i>S. astrifer</i> (n = 4)			<i>S. splendidus</i> (n = 6)		
	Range		\bar{x}	Range		\bar{x}	Range		\bar{x}
SL (mm)	270	280	275.0	233	263	244.3	217	252	237.0
Head length	361	415	388.0	354	368	360.5	338	356	345.8
Head width	318	356	337.0	323	333	327.3	290	314	299.5
Orbital	41	41	41.0	41	50	46.0	40	52	46.2
Interorbital	92	113	102.5	84	97	90.3	69	77	73.5
Snout-2 dorsal fin origin	439	575	507.0	420	487	444.8	423	439	432.5
Snout-anal fin origin	467	659	563.0	570	597	585.5	583	604	594.0
Pectoral fin length	190	202	196.0	193	219	206.8	158	203	178.6
Pelvic fin length	157	166	161.5	144	180	162.0	154	203	170.0

instead of small light spots (Fig. 2B). About 4 continuous light lines between eyes, several more on top of head posterior to these, and 6-8 more lines radiating out from lower part of orbit. Eye slightly smaller than in *S. astrifer* (41 thousandths of SL, 99-115 thousandths of head length compared to 41-50 and 116-139).

Description.—Dorsal fin rays III, 30-32; anal fin rays 24-25; pectoral fin rays 22; vertebrae (11-12) + (26-27) = 37-39; upper lateral line papillae 36-40; lower lateral line papillae 30-33; dentary teeth 22-28; palatine teeth 14-16; total vomerine teeth 10-16; and premaxillary teeth 31-35 in one or two rows on each jaw. Body proportions given in Table 1; both adult type specimens bent, therefore, measurements of SL, snout to second dorsal, and snout to anal could not be made with accuracy.

Underwater photographs of a specimen larger than the types taken by James Bohnsack show a pattern similar to that in Fig. 2A but with a few more and slightly wider lines on the head. The lines are white on a gray-black background.

Etymology.—Named for David W. and Teresa Arambula Greenfield who collected the holotype, suspected it was undescribed, and sent it to me for examination. The Greenfields have been working actively on the fish fauna of Belize for more than a decade and described a new toadfish, *Triathalassothia gloverensis*, from Glovers Reef in 1973 (but it also occurs at Carrie Bow Cay).

Biology.—The holotype was taken by spear from a depression in the sand under a large coral head (*Montastrea*) in one meter of water on the reef flat behind the barrier reef. The fish was facing out so only the front of the head was seen. This is the same type of habitat in which *S. astrifer* has been taken at Glovers Reef (D. W. Greenfield, pers. comm.). The adult paratype was also taken by spear from under a dead coral clump in slightly deeper water on the reef flat behind the barrier reef between Carrie Bow Cay and South Water Cay. James Bohnsack (pers. comm.) photographed an *S. greenfieldorum* in the spur and groove zone of the fore reef at Carrie Bow Cay at a depth of about 6 m at about 9:30 PM during the last week of April 1982. It was under a coral head facing out with a little more of the fish showing than in Fig. 2A. The juvenile paratype was taken with rotenone at 24.4 m over an area of *Montastrea* on the fore reef crest.

The holotype is a male with slightly developed testes. The gut contents consist of fragments of two specimens of the portunid crab, *Portunus vocans* (A. Milne Edwards), one specimen of a majid crab, *Mithrax*, probably *M. pleuracanthus* Stimpson, and a few fish bones. The adult paratype has two large ovaries that occupy much of the body cavity. There are 191 eggs in the left ovary, 178 in the right. The eggs are mostly 5 or 6 mm in diameter. The teeth of the adult paratype are pink and the stomach and intestine were filled with spines and broken pieces of the test of *Diadema antillarum* Philippi. Two crabs were among the gut contents, a female *Portunus vocans* and a chela and carpus from a xanthid crab. There were also fragments of a skull and a few vertebrae of a small fish. The juvenile paratype contained the carapace of an alpheid shrimp, an undescribed species of the isopod *Stenetrium*, and a small snail, *Tricolia* cf. *affinis* (C. B. Adams) of the family Phasianellidae.

Discussion

In my 1974 diagnosis of *Sanopus*, I noted that it lacked the discrete glands on the posterior surface of the pectoral fin between the bases of the upper fin rays that are present in *Opsanus*. I did not point out that there is a well-developed glandular area inside the gill cavity anterior to the pectoral girdle. This shared specialization is characteristic of adults and subadults of all six species of *Sanopus*.

Description of two more species of *Sanopus* raises the toadfish fauna of the western Atlantic to 30 (including three freshwater species in rivers draining into the western Atlantic) in 7 genera (Collette and Russo 1981: table 13). The New World batrachoid fauna now comprises 43 out of a total of about 66 species in the family, confirming the New World as the center of diversity for the family.

Crabs are an important component of the diet of the two new species of *Sanopus* as they are in other species of toadfishes (Collette and Russo 1981). *Diadema* was present in the gut of the adult paratype of *S. greenfieldorum*, in the recently collected specimen of *S. astrifer* from Glovers Reef (FMNH 91034) and in the holotype of *S. johnsoni* (Collette 1974). Randall et al. (1964) reported 15 species from 7 other families as *Diadema* predators.

Egg number and size in *S. greenfieldorum* are comparable to other toadfishes, i.e., relatively few large eggs. Females of 9 species of *Batrachoides* ranging from 106–352 mm SL had 88–588 eggs, 3–6 mm in diameter (Collette and Russo 1981: table 10) compared to *S. greenfieldorum*, 270 mm SL with 369 eggs, 5–6 mm in diameter.

Comparative Material Examined

See Collette (1974) for data on *Sanopus* examined up to that time. Additional material, all from FMNH, is as follows. *S. astrifer*: 91034 (1, 263), Belize, Glovers Reef; 20 June 1978. *S. barbatus*: 91030(1, 330, Honduras, Brus Lagoon; 7 May 1975. 91031(2, 295–330), Honduras, Big Hog Is.; 21 May 1975. 91032(1, 328), Honduras, Big Hog Is.; 20 May 1975. 91033(1, 300), Honduras, Little Hog Is.; 18 May 1975.

Acknowledgments

I thank Dr. H. Wilkens (ZMH) and Mr. Karsten Hartel (MCZ) for loaning me the specimens of *S. reticulatus*. Dr. Karel Liem (MCZ) and Mr. Hartel kindly permitted me to retain one MCZ specimen for the USNM collections. Dr. David W. Greenfield collected the holotype of *S. greenfieldorum*, called my attention to it, and permitted me to retain it for the USNM collections. Dr. Donald Stewart (FMNH) loaned material of *S. greenfieldorum*, *S. astrifer*, and *S. barbatus*. The drawings are by Keiko Hiratsuka Moore. Dr. James Bohnsack provided me with color underwater photographs of a specimen from a night dive at Carrie Bow Cay. Radiographs of the types were made by Ruth Gibbons. Dr. Austin B. Williams identified crustaceans and Dr. Richard S. Houbrick identified the snail in the stomachs of the types. Dr. David W. Greenfield and Dr. Williams read drafts of the manuscript.

Literature Cited

- Barbour, Thomas, and Leon J. Cole. 1906. Reptilia, Amphibia, and Pisces. *In* Vertebrata from Yucatan.—Bulletin of the Museum of Comparative Zoology 50:146–159.
- Collette, Bruce B. 1974. A review of the coral toadfishes of the genus *Sanopus* with descriptions of two new species from Cozumel Island, Mexico.—Proceedings of the Biological Society of Washington 87:185–204.
- , and Joseph L. Russo. 1981. A revision of the scaly toadfishes, genus *Batrachoides*, with descriptions of two new species from the Eastern Pacific.—Bulletin of Marine Science 31(2): 197–233.
- Greenfield, David W., and Terry Greenfield. 1973. *Triathalassothia gloverensis*, a new species of toadfish from Belize (=British Honduras) with remarks on the genus.—Copeia 1973(3):560–565.
- Randall, John E., Robert E. Schroeder, and Walter A. Starck. 1964. Notes on the biology of the echinoid *Diadema antillarum*.—Caribbean Journal of Science 4(2+3):421–433.

National Marine Fisheries Service Systematics Laboratory, National Museum of Natural History, Washington, D.C., 20560.